2015 ASIA-PACIFIC SOLAR RESEARCH CONFERENCE

Peer Reviewed
2015 Solar Research Conference

Kayla Inglis

Recommendations for Implementing Virtual Net Metering into Community-Owned Renewable Energy Projects in Australia

Kayla Inglis[1], Emily Mitchell[1], Robert Passey[2]

[1]*School of Photovoltaics and Renewable Energy, UNSW, Sydney, Australia*

[2]*Centre for Energy and Environmental Markets, UNSW, Sydney, Australia*

E-mail: kayla.inglis@live.com

Abstract

Community-owned Renewable Energy (CORE) in Australia is still in its infancy, but has grown rapidly in recent years, particularly in rural areas; allowing the benefits from renewable energy projects to be widely shared. However, significant barriers stand in the way of many projects getting off the ground: such as finding suitable sites and getting a fair price for electricity. This paper aims to describe the current context for CORE in Australia with particular reference to four different categories of models including multi-household, donation-based, community investment, and commercial-community partnerships.

Virtual Net Metering (VNM), while imminent, barely exists in Australia as current regulations do not yet allow the benefits to be fully realized. However, if a rule change is implemented, VNM has the potential to address some of the most significant challenges facing CORE groups today. This paper describes and analyses the potential of four different VNM arrangements: single entity, third party, solar gardens and retail aggregation; based on their suitability for different types of CORE projects. Preliminary analysis indicates strong potential for each type of VNM arrangement to be implemented into to one or more of the CORE models studied.

1. Introduction

Although government support for renewable energy in Australia has fluctuated in recent years, public support has remained strong (Edward Langham et al., 2015). Community-owned projects have recently emerged as a novel way to drive the uptake of renewable energy in Australia: delivering social, environmental, economic, political and technological benefits to the local and wider community (Allen et al., 2012).

While it is hard to determine precisely what characteristics make a project distinctively “community owned”, for this paper, CORE projects are defined as those owned and/or developed collectively by local communities as opposed to distant, individualised and corporate entities (Walker and Cass, 2007). This means that the projects reflect the motivations and aspirations of the local community by maximising local decision making; and allow financial benefits to be shared widely by ensuring community/local ownership (Hicks et al., 2014).

VNM is a metering arrangement that allows a generation site to assign excess generation to the load at another site. The term ‘virtual’ is used to describe this metering arrangement as electricity is not physically transferred from one site to another, as there is no way to control where the electrons will flow, but it is transferred for billing reconciliation purposes (Langham et al., 2013).

While VNM is not illegal in Australia, there is currently a lack of incentive or requirement for networks and retailers to implement it and hence it does not yet exist apart from one or two trials currently operating in Eastern Australia (ARENA, 2015).

If the generator and consumer are within the same network area then only a portion of the distribution network, and none of the transmission network, are used, and hence this arrangement may help to reduce the need for network augmentation. It is arguable that the generator and/or consumer should then be rewarded in a way that reflects the long run marginal costs (LRMC) avoided by the networks. A rule change request was submitted to the AEMC in July (Hoch and Harris, 2015) to implement cost-reflective local network credits (LNC) to distributed generators.

If LNCs were mandated, VNM arrangements could enable CORE projects to sell electricity for a higher price, helping to overcome one of the major barriers facing CORE projects today.

2. Community-owned Renewable Energy in Australia

There are currently 70 active CORE groups in Australia pursuing projects, with 16 already generating electricity (Embark, 2015). However, current CORE models are limited to suit either large-scale projects that can compete in the wholesale electricity market, or operate 'behind the meter' (such as community solar on commercial sites) so that they get the full value of the electricity generated (C4CE, 2015a). Participating in the wholesale market means dealing with onerous regulatory and compliance obligations, as well leaving the project subject to fluctuating electricity prices, and hence uncertain revenue. Small-scale projects that have a power purchase agreement (PPA) with a retailer are possible but uncommon, as it is difficult to negotiate viable PPA's since retailers are only willing to pay as much as they would to a competing generator in the wholesale market (Ison et al., 2014). The majority of CORE models are designed for 'behind-the-meter' projects, but this restricts projects to specific sites with sufficient available load, and limits the opportunities for CORE projects to sell energy to their members (C4CE, 2015a).

2.1. Large-scale CORE projects

Large-scale CORE projects are typically wind projects that operate in the wholesale electricity market, and hence are typically eligible for large-scale generation certificates (LGCs) as an additional revenue stream. Given that these projects require a lot of capital, it can be significantly more challenging to raise enough investors or donations to get the project off the ground. For this reason, community groups may partner with developers and seek finance from bank debt (Hicks et al., 2014).

Hepburn wind farm, located near Dayelsford in Victoria, is Australia's first CORE project, and remains the largest at 4.2MW. The community group is a co-operative owned by its members, most of whom are local as required. The majority of capital was raised from nearly 2000 investors, reaching almost $10 million; $1.7 million was received in grants and $3.1 million from bank debt (Hepburn Wind, 2015).

Denmark Windfarm, located in WA, has a very different model. It operates as a company where one share entitles an investor to one vote, and there is no requirement for shareholders to be local, however 90% of them are. The project received $2.9 million in funding from grants, $2 million from sale of shares and $1.5 million from bank debt (Hicks et al., 2014).

2.2. Behind the meter CORE projects

The majority of CORE models in Australia operate behind the meter in order to realize the retail value of electricity, which is often required to cover the technology and development costs. The Coalition for Community Energy (C4CE, 2015b) has described some of the most promising behind the meter models that work in the current context as a part of the National Community Energy Strategy (NCES). These models can be broken up in to multi-household, donation-based, community-investment and commercial-community partnership models.

Various authors on this topic use different groupings to describe CORE models, however, for the purpose of this paper and the discussion of compatibility with VNM, this grouping is preferred. This is better than grouping by size because it is more definitive of the legal and financial structures of the models. More information on these models is given in Table 1 including advantages, disadvantages and current examples.

Table 1. Comparison of four different types of behind the meter CORE models, based on information provided by Hick et al. (2014) and C4CE (2015b)

	Key features	Advantages	Disadvantages	Examples
Multi-household	• Aggregating households • Many small Systems (1-5kW) • Current models involve council partner to promote the project and cover capital costs to be repaid through council rates	• Huge potential because there are systems everywhere generating excess • Community group or council partner can make use of buying in bulk and distributing to multiple low income household	• Complex To administer • Difficult to determine eligibility • May rely on council participation and finance	• Solar bulk buys • Moreland Energy Foundation
Donation based	• Community raises funds through donations • Host site and beneficiary is typically a community organisation such as a school, life-saving club, fire-station etc • Initiated, led and owned by community organisation such as sustainability group, school or local trust • Members or donars do not have say on the project direction or earn a dividend • Money goes back to organisation	• Financial model is much simpler • Can allocate revenue to fund additional projects instead returned to investors	• Need to convince donars that idea is worthwhile and trustworthy • First project is hard to fund • Only really suitable for small projects due to size of donations	• CORENA • The Peoples Solar • Clean Energy for Eternity
Community-investment	• Raise funds through community investment • Investors should receive return on investment and have a say on project direction	• Income distributed to investors (often in local community) • sometimes income is distributed to broader community through a community grant fund	• Involves preparing, publishing and distributing an offer document • significant legal and accounting costs • Simplest legal structures limit the maximum number of investors	• Repower Shoalhaven • Clearsky Solar Investments • Sydney Renewable Power Company
Commercial-community Partnership	• Community group partners with a commercial energy developer (or similar) • Dual ownership between community and developer	• partner organisation takes some or most of the financial risk • partner organisation raises some or most of the capital	• Less community ownership and decision making as developer typically owns majority of shares and holds most of the decision making power	• Clearsky Solar Investments • CENREC (partnering with Infigen)

2.3. Current challenges facing CORE groups

In the current regulatory environment, there is little incentive to install distributed generation (DG) unless all generation can be consumed on site. While incentive-based feed-in tariff (FiT) programs for small-scale renewable generators ranging from 20-60c/kWh has driven rapid uptake in rooftop PV, they have steadily been rolled back. FiT arrangements for DG installed now are market-driven, and so are based on the wholesale market value of PV exports (Langham et al., 2013). Considering how low the value of market-driven FiTs (4-5c/kWh) are relative to the high capital cost of DG technologies, most projects including CORE projects are limited to sites that have a large day-time load. This makes it much more challenging for CORE groups to gain a fair price for electricity, and access suitable host sites.

Getting a fair price for electricity has been highlighted in numerous studies and surveys conducted in Australia as one of the most significant barriers facing CORE projects today. A comprehensive survey conducted in 2012 by the CPA covering 28 Australian CORE projects and 9 supporting organizations found that financing the development stage (inception, social feasibility, technical feasibility and planning), and getting a fair price for electricity were the two major challenges facing CORE groups. Grid connection, planning laws and processes, and making the business case work were also identified as significant challenges (Ison et al., 2012).

More recently the C4CE outlined a range of cost barriers currently facing CORE projects in Australia as a part of their cost reduction potential analysis in the NCES (Edward Langham et al., 2015). They found that institutional costs such as financing the project development and delivery, securing a fair price for electricity, and grid connection were among the most significant financial barriers facing CORE projects.

Two key points to take from the study are (Edward Langham et al., 2015):

1. Project development income (eg. grants and sponsorship) represent a relatively small component of project income as an annualised cost.
2. Most of the solar projects focus on maximising behind the meter electricity sales and reducing exports to increase revenues.

The authors thought that the need to reduce grid exports would diminish if the generators were granted higher value for exports to the grid through LNC or a VNM arrangement. This would in turn open up a larger number of sites as community energy hosts, overcoming a key barrier for community energy groups (Edward Langham et al., 2015).

Lack of access to host sites was found by Kirsch et al. (2015), in a survey of 27 CORE groups, to make the biggest difference between those that have established operating projects and those with projects yet to reach operation. This was followed by the political and/or regulatory environment and the lack of replicable business models available.

3. Virtual Net Metering

While there are many barriers facing CORE projects today, this paper aims to analyse how enabling VNM can help projects sell energy at a fair price and locate more suitable host sites, which may be facilitated by a regulatory environment that rewards distributed generators for selling electricity within a local network area.

3.1. Local network charges

The network use of system (NUoS) charge makes up a significant portion of a user's electricity bill, and is divided into distribution use of system (DUoS) charges and transmission use of system (TUoS) charges. Distributed generation may reduce the need for network augmentation in that area if they generate during times of peak demand, and hence it is arguable that the generators should be rewarded accordingly (Langham et al., 2013). Rewarding generators through VNM would significantly improve their business case, and hence open up a new opportunity for CORE projects. Another benefit of local generation is the reduction in transmission and distribution losses.

However, under current rules in Australia, full DUoS charges apply regardless of how much of the network is used. A rule change proposal was recently submitted to the AEMC, by the Total Environment Centre (TEC) and the City of Sydney, to require DNSPs to implement LNCs that reflect the economic benefit that DG has on the network (Hoch and Harris, 2015). The challenge remains regarding how best to calculate LNCs ensuring cost reflectivity and adequate price signals to local generators.

While the value of LNCs will affect the amount of revenue CORE projects may receive from implementing VNM, and may favour particular VNM arrangements, the details of how they are calculated and allocated are beyond the scope of this paper, and will not be discussed further[1]. Instead, we focus on how the different types of VNM arrangements affect CORE projects.

3.2. VNM Arrangements

Langham et al. (2014) describe four distinct types of VNM arrangements: single entity VNM, third party VNM, ‘solar gardens’ (where a community or group own distributed generation and sell electricity to shareholders) and retail aggregation. While only one is a distinctive CORE model, the other arrangements have the potential to be integrated into existing CORE models, and hence all four will be analysed in this paper. A comparison of how these models work and could be used in community projects, incorporating information provided in the report by Langham et al. (2014), is provided in Table 2. While the single entity and third party VNM arrangements have the potential to be integrated into existing models, the solar garden arrangement has the potential to provide the highest financial and social benefit to the community.

[1] See "Towards a Method to Calculate a Local Network Credit" by Langham et. Al (2015) for a detailed analysis of different options for calculating a cost reflecting LNC.

Table 2: Comparison of different VNM arrangements

VNM Arrangement	Description	Application to community projects	Benefits	Drawbacks	Examples
Single Entity	Electricity generated at one site is netted off to another site owned by the same entity	Could be adopted in to existing behind-the meter CORE models through partnering with suitable entity where the community group raises the capital through shares, then sells the electricity generated to the entity under a PPA until the system has been paid off	• Could potentially be quite easily adopted to existing models, so no need to develop new ones • Easier to site CORE projects • Better value for exported generation through LNCs • One customer (one retailer), so simpler billing	• Profit is very dependent on LNCs • Benefits could be more widely spread • Size of projects may be limited by	**Byron Shire VNM trial.** A large solar array installed on the council owned sporting centre with ample roof space but low load will allow excess generation to be credited against the consumption of a nearby sewage plant, also owned by the council (Parkinson, 2015a).
Third Party	A distributed generator assigns their excess generation to a customer, or group of customers that may or may not remain within the local distribution area	Similar to above, however the community group would need to engage with at least two entities	• Could potentially be quite easily adopted to existing models, so no need to develop new ones • Easier to site CORE projects • Better value for exported generation through LNCs • Allows customers such as renters or those without suitable rooftops to access clean electricity • Allow residential customers to benefit from economies of scale	• Profit is very dependent on LNCs, therefore likely to be limited to local arrangements • Multiple entities means multiple retailers, meaning that billing is more complex	**UTS and Singleton solar farm** UTS have recently signed an agreement to buy the output from 200kW Singleton solar farm, located 150km away in the Hunter Valley (Parkinson, 2015b).
Solar garden	Similar to above arrangement, except that the customers are also the shareholders and effectively receive a return on their investment through a credit on their electricity bill	This would be a new model for CORE projects in Australia, whereby community shareholders have access the electricity generated from the installation	• Allow shareholder to receive a higher ROI through avoided tax (since revenue is returned in the form of a credit on the electricity bill) • Easier to site CORE projects • Better value for exported generation through LNCs • Allows customers such as renters or those without suitable rooftops to access clean electricity • Allow residential customers to benefit from economies of scale • High sense of ownership from community shareholders	• Requires establishment of new CORE model in Australia • Profit depends on LNCs • Multiple entities means multiple retailers, meaning that billing is more complex	**Solar gardens in the US** At least 11 states in the US have pilot projects and legislations authorising solar gardens. While each states legislation varies, they each allow local subscribers to purchase a portion of the array and receive a credit on their electricity bill (Durkay, 2015).
Retail Aggregation	The excess generation from several small distributed generation is pooled together and sold to a commercial customer	• This could be facilitated by a community owned retailer who is driven by more than just financial gain. • Could be used to improve the business case of existing models such as sola savers	• Allows small distributed generators to get more value for excess generation • This retailer could also broker other VNM arrangements that are too small to interest other retailers	• Can be complex to administer • May be hard to determine who is eligible	**Enova Community Energy** Enova energy (currently seeking investment**)**, is a community owned energy retailer, and aims to trial concepts like VNM to lower costs of local distribution (Enova Community Energy, 2015). If successful, Enova will be in a good position to operate as a retail aggregator.

4. Preliminary Analysis and Future Work

Although the development of both CORE projects and VNM in Australia is relatively recent, a significant body of work is already appearing in the literature. However, there is still much to be examined, particularly regarding how they may interact and be of mutual benefit. VNM poses a unique opportunity to address some of the most significant challenges facing CORE groups today. The different VNM arrangements described in Table 2 have varying levels of application to different types of CORE models (described in Table 1). Table 3 introduces a preliminary analysis of these applications by indicating which combinations are possible, potentially possible or not possible.

Table 3 Suitability of four different VNM arrangements to four different types of CORE models

		CORE models			
		Multi-household	**Donation based**	**Community investment**	**Commercial-community Partnership**
VNM Arrangement	**Single Entity**	✗ Not applicable	? Unlikely that recipient organisation has multiple sites	✓ Community could fund installation of array, earn additional revenue from single entity	? If site is very large, commercial partner would help raise capital
	Third Party	✗ Not applicable	✓ Donations could be raised to fund installation if either entity was a community organisation	✓ Community could fund installation of array, earn additional revenue from at least two entities	? If site is very large, commercial partner would help raise capital
	Solar garden	✗ Not applicable	✗ Not applicable	✓ Community funds installation, and earns revenue through credit on electricity bill	✓ Community could fund portion of larger installation developed by a commercial partner
	Retail Aggregation	✓ Community retailer aggregates output from multiple households (maybe low-income) and sells to larger entity	✗ Not applicable	✗ Not applicable	✗ Not applicable

4.1. Single entity VNM

Single entity VNM would be best suited to a community investment style model, where the community could invest in the installation of a solar system on a building that would sell excess generation to a nearby site owned by the same entity. For example, the VNM trial taking place in Byron Bay involves two council-owned facilities: a sporting centre with a large roof, but small load, and a sewage treatment plant with an unsuitable roof but a large daytime load (Parkinson, 2015a). In this type of arrangement, community investors could raise the capital for the solar installation, and receive revenue from the council buying electricity for both sites. The benefit of this VNM arrangement is that it means that the community group has to engage with only one entity, as the sites where the electricity is generated and exported to have a single owner and a single retailer. This type of arrangement has the potential to be adapted into existing CORE models such as REpower Shoalhaven, which has installed a 99kW system onto the local bowling club, funded by community investors, who are repaid from the bowling club buying electricity generated from the PV array until the system has been paid off (REpower Shoalhaven, 2015). While this particular project aims to have minimal exported generation, future projects that incorporated a single entity VNM arrangement using a similar business model could have much larger PV systems, which would open up more opportunities for REpower or similar projects. Adapting a successful existing model can save community groups significant time and effort, as opposed to coming up with an entirely new one.

4.2. Third party VNM

A third party VNM arrangement may be suitable to either a donation-based or community investment model. It could be applied to a community investment model in a similar way to the single entity arrangement, except that it may be more complex to administer since multiple entities and retailers are involved. The third party arrangement could be implemented into a donation-based community energy model like CORENA, if the generator site and/or the site which the exported electricity is sold to is a community organisation like a school or library. While the beneficiaries don't have to be community organisations, people are more inclined to donate if they are. The CORENA model uses a revolving fund pool, so that the repayments can be used to fund more projects, until it is eventually self-funding (C4CE, 2015b).

4.3. Solar garden

A solar garden may be applicable to either a community investment model or a commercial-community partnership, where community investors earn dividends through a credit on their electricity bill. This is an entirely new model in Australia so it would be challenging for a community group to initiate without the help from an electricity retailer. Enova Community Energy is a retailer currently hoping to start up in Australia in the near future, and has expressed an interest in pursuing this sort of approach.

4.4. Retail aggregation

By definition, retail aggregation refers to pooling together the output from multiple households and hence is only suitable for one type of CORE model. Current multi-household community models provide an affordable option for households to install solar. For example, Darebin Solar Savers is a program offered to pensioners, where the council covers the upfront costs of the system, which is repaid through council rates. It is classified as a community project because it is delivered by a community organisation in partnership with Local Council (MEFL, 2015). The value of this project could be improved if a retailer could aggregate the excess generation from the systems and sell it to a larger commercial entity under a VNM arrangement. There is little incentive for commercial retailers to implement this kind of arrangement, but it is a good opportunity for a community-owned retailer like Enova Community Energy to facilitate. This could lead to the development of new programs for low income households by shortening the payback time through this additional revenue stream.

4.5. Future work

With a number of VNM trials set to take place across the country, future work will focus on the potential application of different VNM arrangements to CORE projects based on a set of assessment criteria: ease of implementation; experience in Australia; experience overseas; level of community ownership/participation; revenue; project costs; non-financial benefit; improvement of access to renewable energy; regulatory environment; capacity of community groups to deliver. Case studies may include the VNM arrangement between the University of Technology Sydney (UTS) and Singleton Solar (described in Table 2).

Enova Community Energy may become the first community-owned retailer in Australia, and aims to support the local renewable energy industry and is committed to returning 50 per cent of the profits into projects that benefit the community. If successful, Enova may provide an interesting case study as an enabler, not only for the retail aggregator model but for each of the VNM models.

5. Conclusion

The community energy space in Australia is new but moving quickly, and gaining increasing public support. However, significant barriers such as finding suitable sites and getting a fair price for electricity still remain. VNM, while not yet operating in Australia, has a unique potential to address these challenges. At this stage, it is difficult to determine how best to implement VNM into CORE projects. However, preliminary analysis indicates a strong potential for incorporating VNM into existing CORE models as well as forming completely new ones. While some VNM arrangements are evidently better suited to certain types of CORE models, further research and analysis is required before strong conclusions can be drawn.

References

Allen, P., Harper, P., Shepherd, A., 2012. The Home Energy Handbook.

ARENA, 2015. Investigating local network charges and virtual net metering.

C4CE, 2015a. National Community Energy Strategy.

C4CE, 2015b. Behind the Meter Community Solar Models (An Appendix of the National Community Energy Strategy).

Durkay, J., 2015. Net Metering: Policy Overview and State Legislatuve Updates. Natl. Confrence State Legis.

Embark, 2015. Australian Community Energy Groups [WWW Document]. URL http://www.embark.com.au/display/public/Groups/Australian+community+energy+groups;jsessionid=6630F1AB0A871D7C8923AB514EAF47F7 (accessed 10.18.15).

Enova Community Energy, 2015. Enova Investor Prospectus.

Hepburn Wind, 2015. About the Wind Farm [WWW Document]. URL http://www.hepburnwind.com.au/wind-farm/ (accessed 10.10.15).

Hicks, J., Ison, N., Gilding, J., Mey, F., 2014. Community-owned renewable energy: a how to guide. Community Power Agency.

Hoch, L., Harris, R., 2015. Local Generation Network Credit Rule Change Proposal.

Submission to AEMC by City of Sydney, Total Environment Centre, and Property Council of Australia.

Ison, N., Byrne, M., Gilding, J., Hicks, J., Memery, C., 2014. Community Energy Advocacy Strategy. Coalition for Community Energy.

Ison, N., Hicks, J., Gilding, J., Ross, K., 2012. The Australian Community Renewable Energy Sector: Challenges and Opportunities. Prepared by a consortium including Backroad Connections, Community Power Agency, and the Institute for Sustainable Futures, University of Technology Sydney with funding from the NSW Office of Environment and Heritage.

Kirsch, C., Jackson, M., Langham, E., Ison, N., 2015. Community Energy Collective Impact Assessment (An Appendix of the National Community Energy Strategy). Coalition for Community Energy.

Langham, E., Cooper, C., Ison, N., 2013. Virtual Net Metering in Australia: Opportunities and Barriers. Institute for Sustainable Futures, University of Technology Sydney.

Langham, E., Ison, N., Madden, B., 2015. Community Energy Cost Analysis and Cost Reduction Potential (An Appendix of the National Community Energy Strategy). Coalition for Community Energy.

Langham, E., Rutovitz, J., Cooper, C., Dunstan, C., 2014. Calculating the Network Value of Local Generation and Consumption. Institute for Sustainable Futures, University of Technology Sydney.

Langham, E., Rutovitz, J., McIntosh, L., 2015. Towards a Method to Calculate a Local Network Credit.

MEFL, 2015. Darebin Solar $aver [WWW Document]. Morel. Energy Found. URL http://www.mefl.com.au/news-and-events/item/1146-darebin-solar-aver.html (accessed 9.9.15).

Parkinson, G., 2015a. Byron Shire to Be First in Australia to Pilot Virtual Net Metering. Reneweconomy.

Parkinson, G., 2015b. UTS Takes Lead in First Australian Corporate Purchase of Offsite Solar. Reneweconomy.

REpower Shoalhaven, 2015. About REpower Shoalhaven [WWW Document]. URL http://www.repower.net.au/about.html (accessed 10.8.15).

Walker, G., Cass, N., 2007. Carbon Reduction, “The Public” and Renewable Energy. Area 39.4, 458–469.